What is claimed is:

1. A channel adapter that is used in a disk array device and controls data exchange with a upper-level device, the channel adapter comprising:

an internal memory that stores data from an external memory;

a guarantee code computing unit that computes an input guarantee code in regard to the data inputted to the internal memory and computes an output guarantee code in regard to the data read from the internal memory, with the guarantee codes being retainable in the guarantee code computing unit;

a communication unit that transmits the data read from the internal memory to the upper-level device; and

a control unit which, in a case where partial data of the data is to be retransmitted to the upper-level device, uses the communication unit to transmit the partial data to the upper-level device, compares the input guarantee code and the output guarantee code recalculated by the guarantee code computing unit in regard to the data, and determines that transmission of the data has been conducted normally in a case where both guarantee codes are in conformity.

2. The channel adapter of claim 1, wherein the guarantee code computing unit computes the input guarantee code or the output guarantee code in regard to all of the data inputted

to and outputted from the internal memory.

3.   The channel adapter of claim 1, wherein in the case where the partial data is to be retransmitted to the upper-level device, the control unit

(1) uses the communication unit to transmit the partial data to the upper-level device,

(2) reads the data from the internal memory and dummy-transfers the data to the communication unit,

(3) uses the guarantee code computing unit to recalculate the output guarantee code in regard to the dummy-transferred data,

(4) compares the recalculated output guarantee code with the input guarantee code calculated when the data is stored in the internal memory, and

(5) notifies the upper-level device that transmission of the partial data has been conducted normally in a case where the recalculated output guarantee code and the input guarantee code match, and notifies the upper-level device that transmission of the partial data has not been conducted normally in a case where the recalculated output guarantee code and the input guarantee code do not match.

4.   The channel adapter of claim 1, wherein in the case where the partial data is to be retransmitted to the upper-level device,

31

the control unit

(1) reads partial data from the internal memory and transfers the partial data to the communication unit, to thereby transmit the partial data to the upper-level device,

(2) uses the guarantee code computing unit to compute a partial output guarantee code in regard to the partial data read from the internal memory,

(3) confirms that the partial output guarantee code and the input guarantee code computed when the data is stored in the internal memory do not match,

(4) reads the data from the internal memory and dummy-transfers the data to the communication unit,

(5) uses the guarantee code computing unit to recalculate the output guarantee code in regard to the dummy-transferred data,

(6) compares the recalculated output guarantee code with the input guarantee code calculated when the data is stored in the internal memory, and

(7) notifies the upper-level device that transmission of the partial data has been conducted normally in a case where the recalculated output guarantee code and the input guarantee code match, and notifies the upper-level device that transmission of the partial data has not been conducted normally in a case where the recalculated output guarantee code and the input guarantee code do not match.

5.   The channel adapter of claim 2 or 3, wherein the data
that is dummy-transferred to the communication unit by the
control unit is nullified without being sent to the upper-level
device.

6.   The channel adapter of claim 1, wherein data exchange
between the channel adapter and the upper-level device is
conducted in accordance with a TCP/IP protocol and data exchange
between the channel adapter and the external memory is conducted
in accordance with a fibre channel protocol.

7.   A method of controlling a channel adapter that is used
in a disk array device and controls data exchange with a
upper-level device, the method comprising the steps of:
        in a case where partial data of data already transmitted
to the upper-level device is to be retransmitted to the
upper-level device,
        reading the partial data from an internal memory and
transmitting the partial data to the upper-level device;
        comparing an output guarantee code computed in regard
to all of the data with an input guarantee code computed when
the data is inputted to the internal memory; and
        determining that transmission of the partial data has
been conducted normally in a case where both guarantee codes

33

match.

8.   A method of controlling a channel adapter that is used
in a disk array device and controls data exchange with a
upper-level device, the method comprising:

a first step of storing data from an external memory in
an internal memory;

a second step of computing and retaining an input guarantee
code in regard to all of the data when the data is inputted
to the internal memory;

a third step of reading the data from the internal memory;

a fourth step of computing and retaining an output
guarantee code in regard to all of the read data;

a fifth step of transmitting the read data to the
upper-level device;

a sixth step of determining, and notifying the upper-level
device, whether or not transmission has been conducted normally
by comparing the input guarantee code and the output guarantee
code;

a seventh step of determining whether or not there is
a retransmit request from the upper-level device in regard to
partial data of the data sent to the upper-level device;

an eighth step of reading the partial data from the internal
memory and transmitting the partial data to the upper-level
device in a case where there is a request to retransmit the

partial data;

a ninth step of rereading data stored in the internal memory;

a tenth step of again computing an output guarantee code in regard to all of the reread data; and

an eleventh step of determining, and notifying the upper-level device, whether or not transmission has been conducted normally by comparing the again-computed output guarantee code and the input guarantee code computed in the second step.

9.   A disk array device comprising:

a channel adapter that is connected to a upper-level device via a communications network and controls data exchange with the upper-level device;

a storage device that stores data;

a disk adapter that controls data exchange with the storage device; and

a cache memory that stores data read from the storage device or data received from the upper-level device, wherein

the channel adapter includes

an internal memory that stores data from the cache memory,

an input guarantee code computing unit that computes and retains an input guarantee code in regard to the data in a case where the data is stored in the internal memory,

an output guarantee code computing unit that computes and retains an output guarantee code in regard to the data in a case where the data is read from the internal memory,

a communication unit that transmits the data read from the internal memory to the upper-level device, and

a control unit which, in a case where partial data of the data is to be retransmitted to the upper-level device, (1) uses the communication unit to transmit the partial data to the upper-level device, (2) uses the output guarantee code computing unit to recalculate the output guarantee code in regard to the data, and (3) compares the recalculated output guarantee code with the input guarantee code and determines that transmission of the data has been conducted normally in a case where both guarantee codes match.

10. A communication unit that is connected to an internal memory via a data transfer control unit and transmits data read from the internal memory to a upper-level device, wherein

after the communication unit reads partial data of data stored in the internal memory and transmits the partial data to the upper-level device, the communication unit reads all of the data from the internal memory and nullifies the read data without transmitting it to the upper-level device.